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## Strontium and barium uptake in aragonitic otoliths of marine fish

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**Abstract**—Minor and trace element analyses of fish otoliths (ear stones) may provide a high-resolution reconstruction of temperature histories and trace element compositions of aquatic systems where other environmental proxies are not available. However, before otoliths can be used to reconstruct water chemistry, it is essential to validate the assumption that trace metals in otoliths are deposited in proportion to dissolved concentrations in the ambient environment. We show, using a marine fish (*Leiostomus xanthurus*) reared in the laboratory under controlled experimental conditions, that otolith Sr/Ca and Ba/Ca ratios are deposited in proportion to their respective ratios in ambient waters. Temperature significantly affected Sr incorporation but did not affect Ba incorporation in otoliths. Sr/Ca partition coefficients ( $D_{Sr}$ ) were 0.182 and 0.205 at 20°C and 25°C, respectively. The partition coefficients for Ba/Ca were 0.055 at 20°C and 0.062 at 25°C. A nonlinearity in the relationship between  $D_{Ba}$  and ambient Ba concentrations suggested that extrapolation beyond the Ba levels used in the experiment was not justified. On the basis of our results, it should be possible to reconstruct Sr/Ca and Ba/Ca levels in environments inhabited by fish based on otolith chemistry. Furthermore, Sr/Ca thermometry may also be possible using fish otoliths, but validation of the temperature dependence of Sr/Ca in otoliths will be required. We believe otoliths represent an excellent, and as yet underused, record of the physicochemical properties of both modern and ancient aquatic environments. Copyright © 2000 Elsevier Science Ltd